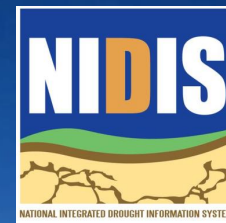


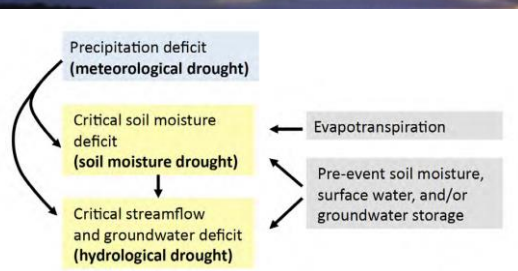


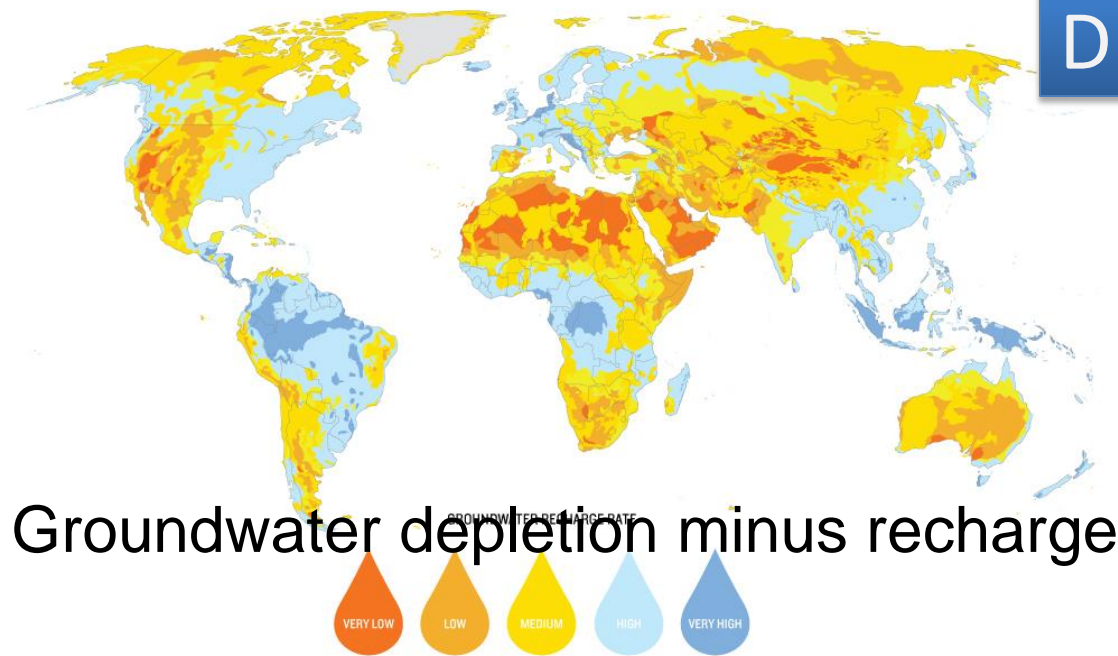
The National Integrated Drought Information System:



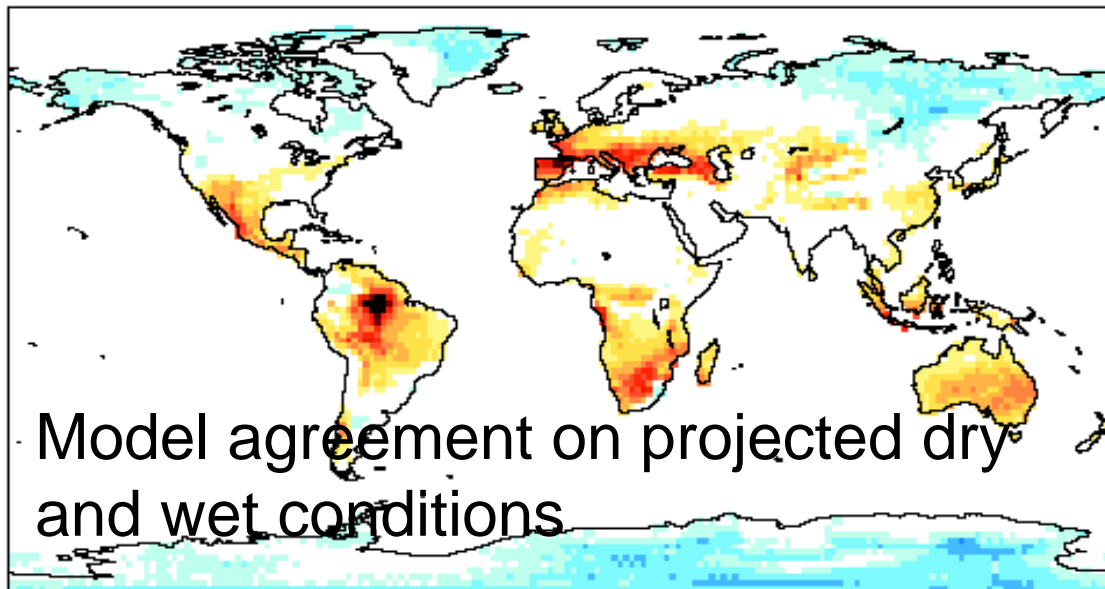
Big data and bigger questions

Roger S. Pulwarty
Senior Advisor for Climate and
Director, NIDIS. NOAA
AND a lot of other people-M. Strobel,
M. Brusberg, J. Verdin, WGA/WSWC



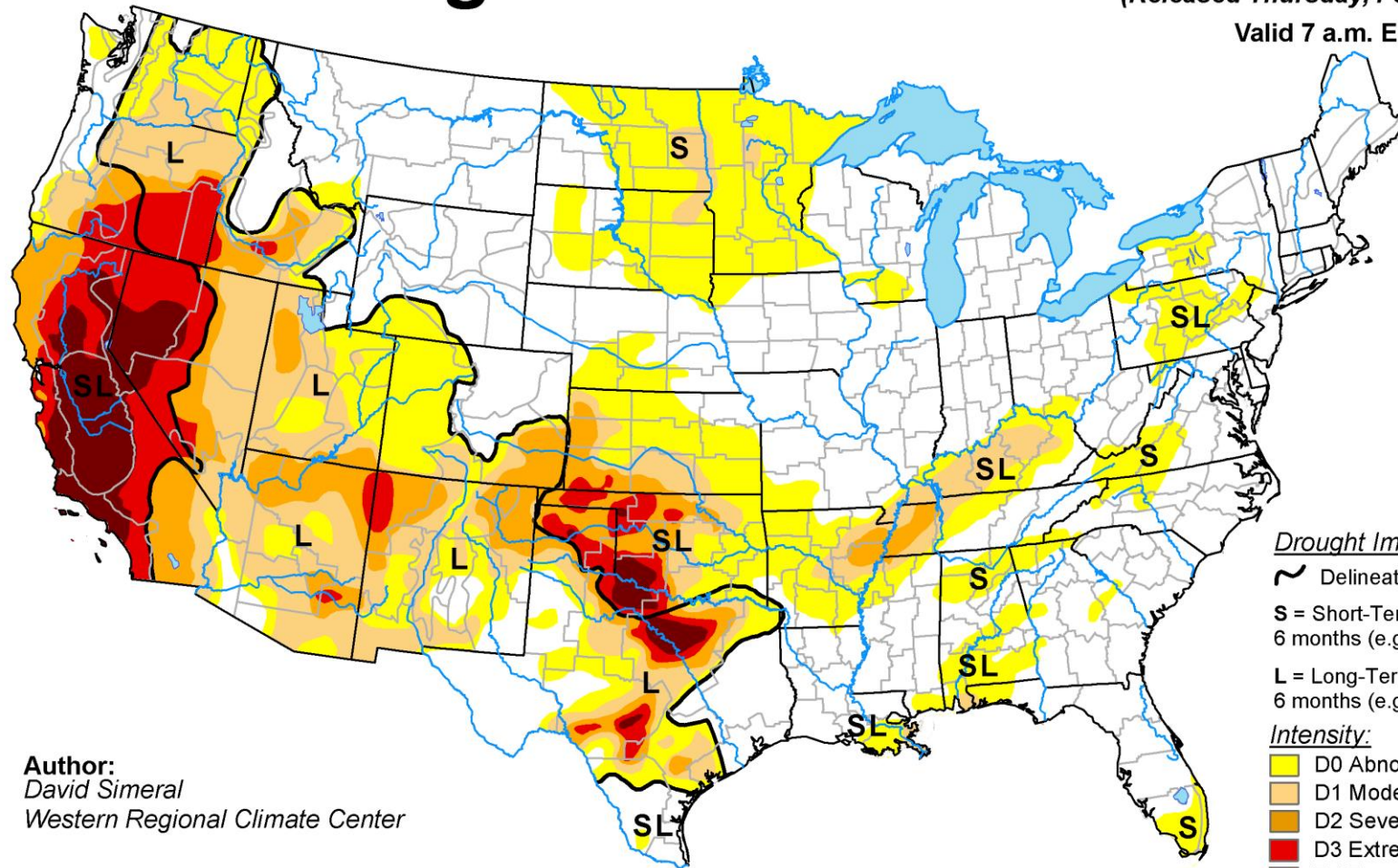


- Rainfall
- Rainfall plus potential evaporation
- Rainfall plus evaporation
- Land surface models: Soil moisture
- Land surface plus hydrology: Streamflow



U.S. Drought Monitor

February 10, 2015
(Released Thursday, Feb. 12, 2015)
Valid 7 a.m. EST



Author:
David Simeral
Western Regional Climate Center

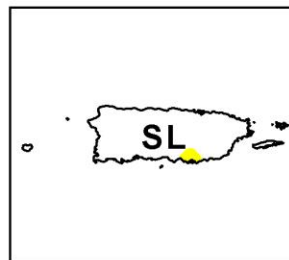
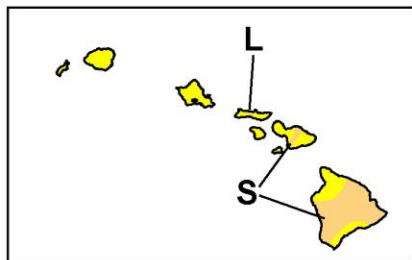
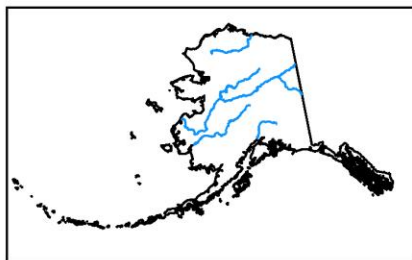
Drought Impact Types:

- ~ Delineates dominant impacts
- S** = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)
- L** = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

Intensity:

- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.



<http://droughtmonitor.unl.edu/>

How did we get here? Status and antecedent conditions

2010

Why has it been dry/drier than normal? Is this drought like others?

2011

What are the impacts and where did they occur?

What information is being provided and by whom?

2012

How bad might it get and how long will it last?

How are we planning for this year and for longer-term risks and opportunities?

2013

September 16, 2014

(Released Thursday, Sep. 18, 2014)

Valid 8 a.m. EDT

Drought Conditions (Percent area)					
	None	D0-D1	D2	D3	D4
Current	25.1%	12.2%	17.2%	38.8%	8.8%
Last Week	25.1%	11.8%	17.3%	38.8%	8.8%
1 Month Ago	25.1%	10.8%	18.2%	41.1%	5.8%
2 Months Ago	25.1%	10.8%	18.2%	41.1%	5.8%
3 Months Ago	25.1%	10.8%	18.2%	41.1%	5.8%
4 Months Ago	25.1%	10.8%	18.2%	41.1%	5.8%
5 Months Ago	25.1%	10.8%	18.2%	41.1%	5.8%
6 Months Ago	25.1%	10.8%	18.2%	41.1%	5.8%
7 Months Ago	25.1%	10.8%	18.2%	41.1%	5.8%
8 Months Ago	25.1%	10.8%	18.2%	41.1%	5.8%
9 Months Ago	25.1%	10.8%	18.2%	41.1%	5.8%
10 Months Ago	25.1%	10.8%	18.2%	41.1%	5.8%
11 Months Ago	25.1%	10.8%	18.2%	41.1%	5.8%
12 Months Ago	25.1%	10.8%	18.2%	41.1%	5.8%

Legend:
 D0: Extreme Drought
 D1: Severe Drought
 D2: Moderate Drought
 D3: Significant Drought
 D4: Exceptional Drought

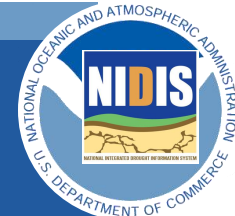
The Drought Monitor is based on the best available information. It is not a forecast and should not be used for legal or financial purposes.

Author:
 National Drought
 Mitigation

USDA
 National Drought
 Mitigation

http://droughtmonitor.unl.edu/

September 2014



NIDIS 2014: Public Law 113-86

“Today, I signed the National Integrated Drought Information System Reauthorization Act into law.....to help communities better prepare for droughts..., and prevent the worst impacts on families and businesses”

March 6, 2014. President Obama



Barack Obama

“develop and expand the Regional Drought Early Warning Information Systems”

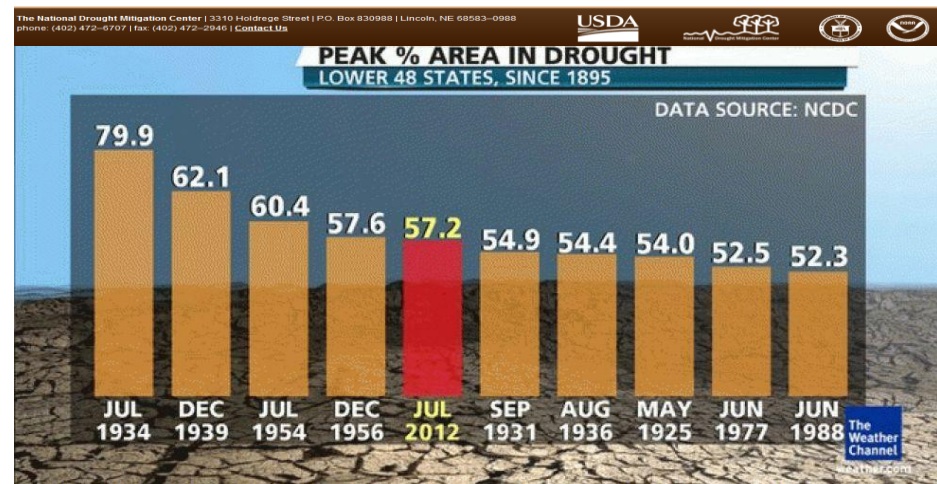
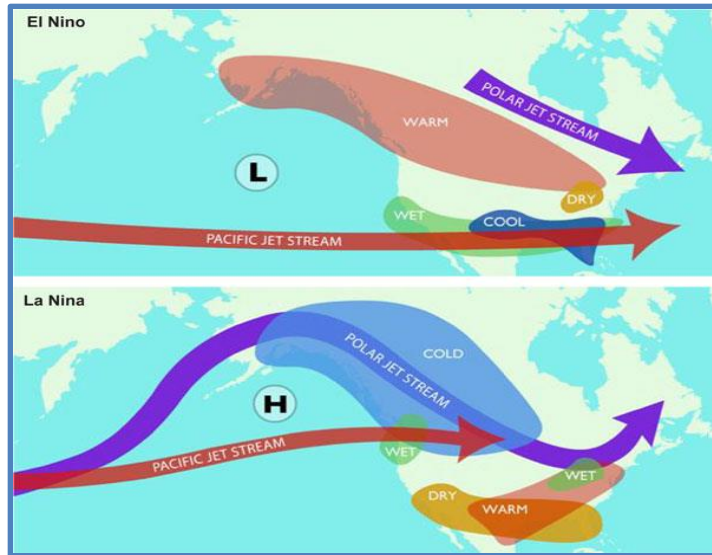
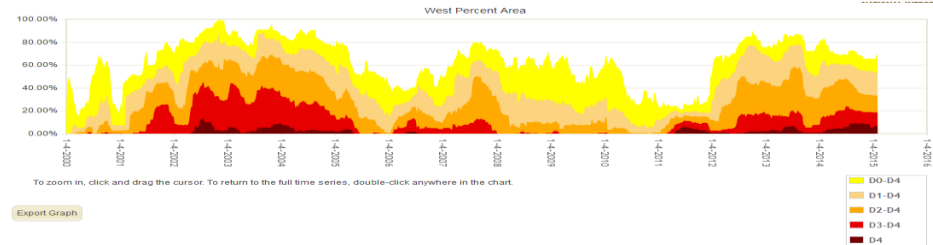
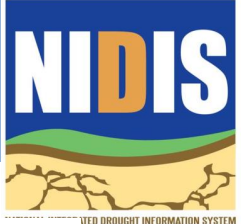
May, 2014 <http://appropriations.house.gov/uploadedfiles/hrpt-113-hr-fy2015-cjs.pdf>

United States Senate Committee on
**AGRICULTURE
NUTRITION
& FORESTRY**

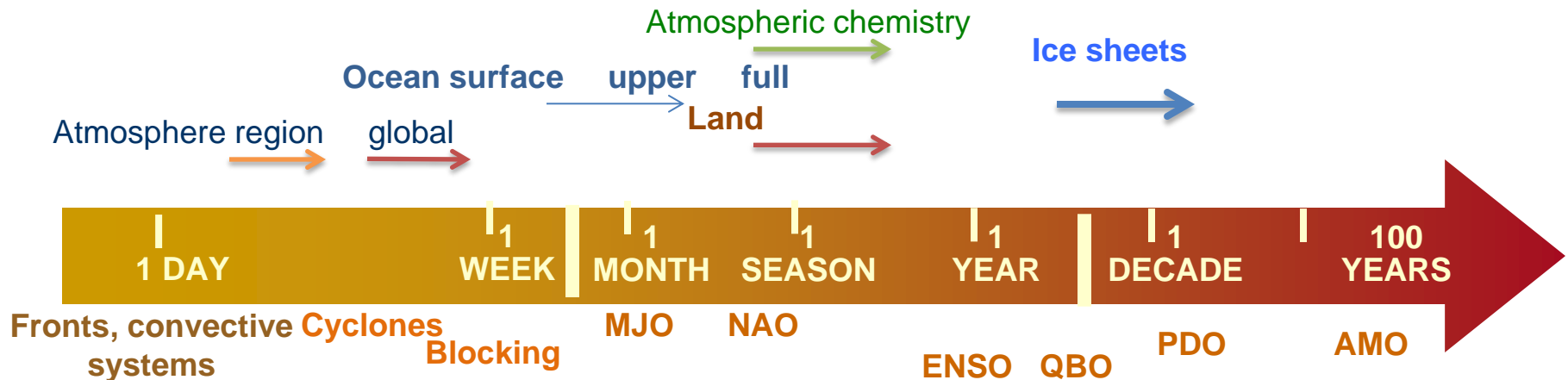




Drought: Weather-climate continuum and Adaptation deficits



6



Pathways to Drought Monitoring and Predictability

Key Phenomena, variables

Ocean
Temp
anomalies

Global-Scale
Atmospheric
Changes

Regional
Forcing and
land feedbacks

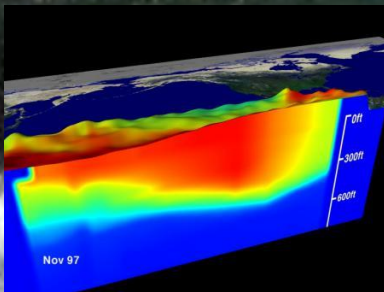
Local Impacts,
Info needs

ENSO, PDO,
AMO, warm pool
variability,
Global Warming,
etc

planetary waves,
hydrological cycle,
monsoons,
Hadley Cell,
Walker
Circulation

precipitation, soil
moisture, snow, low
level jets, dust,
vegetation,
land/atmosphere
contrasts, changes
in weather

soil moisture,
stream flow,
precipitation,
ground water,
lakes,
reservoirs



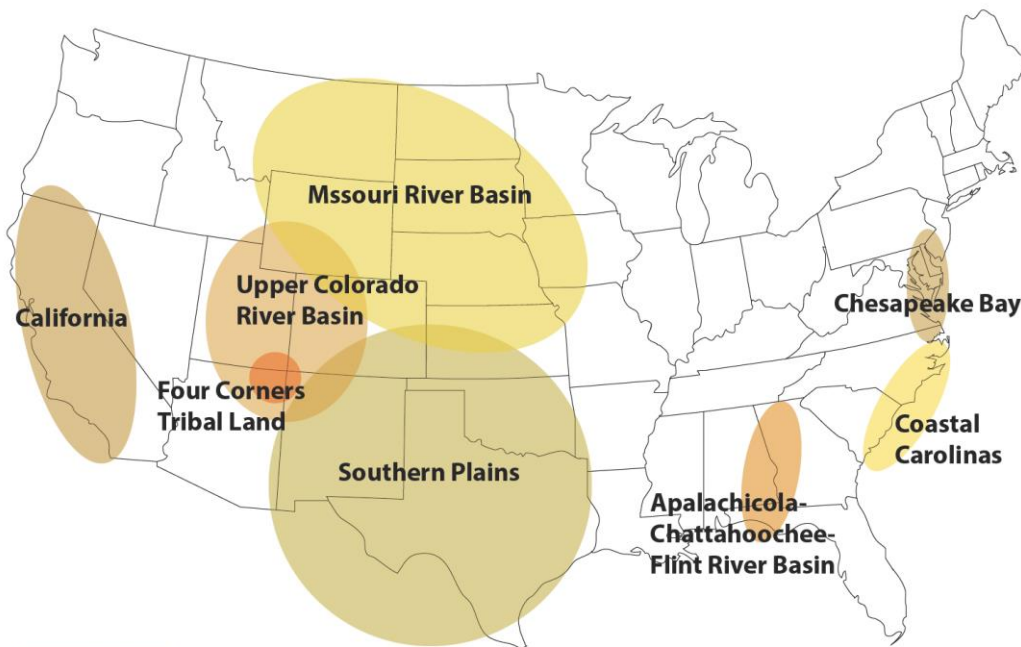
Regional Drought Early
Warning Systems

Applications

Support cross-regional
efforts to assess user needs,
test drought-focused
decision support tools

National Integrated
Drought Sciences and
Assessments (NIDISA)

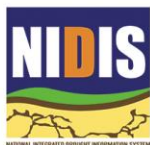
Sectoral Appli
Research Pro
(SARP)



Modeling Analysis
Predictions and
Projections

NATIONAL DROUGHT
INVESTIGATION CENTER
(NDMC)

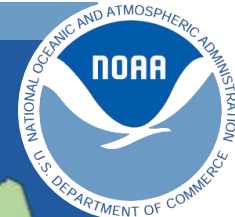
Regional Climate
Centers
State Climatologists



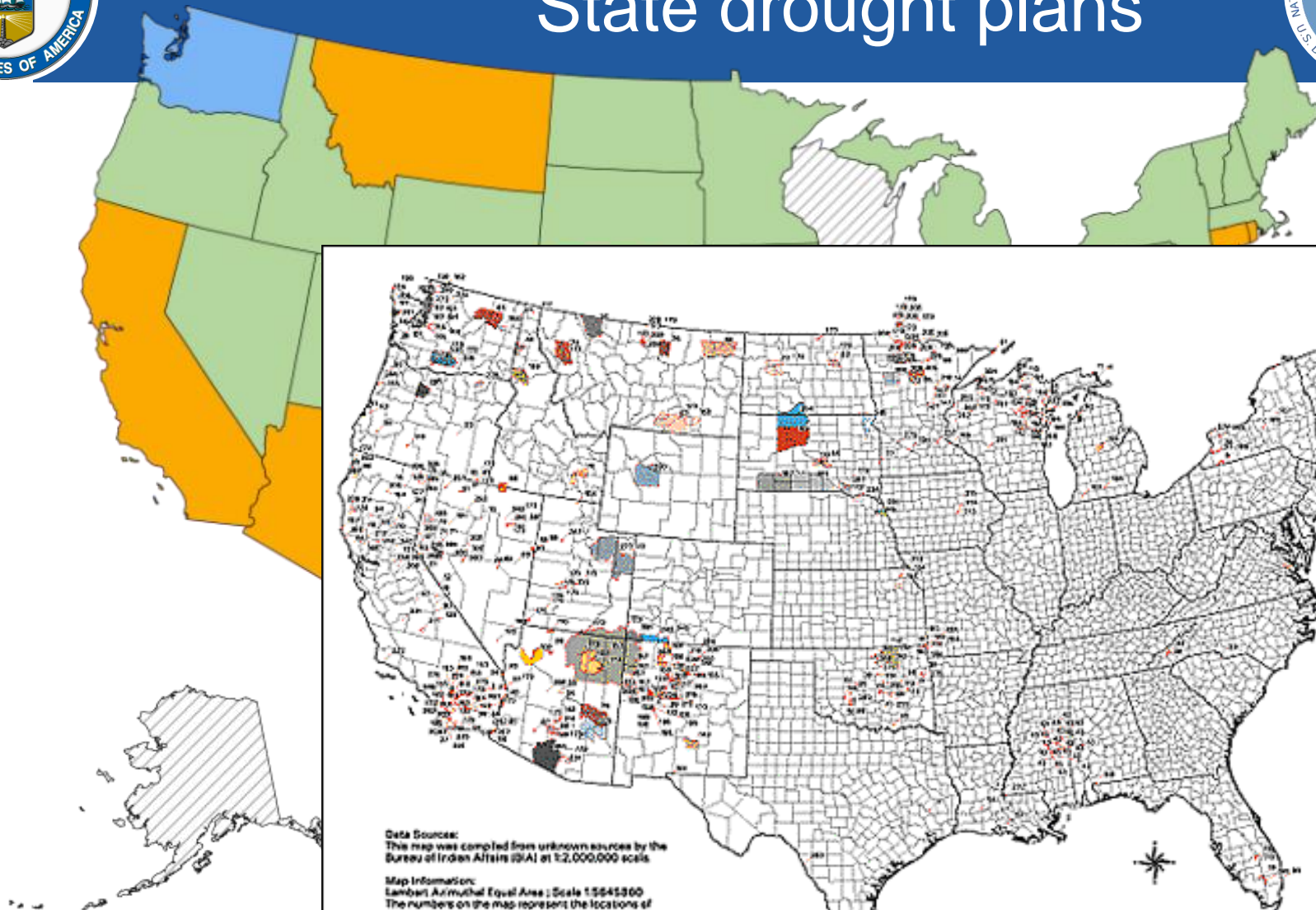
Identify socio-ec
effects of drought, data
and info needs of
resource managers and
policy/decision makers

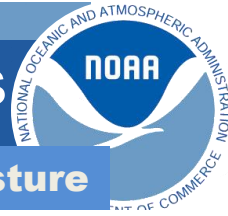
Evaluate and transition drought
information products to
emergency response AND

Drought Preparedness and
risk management planning



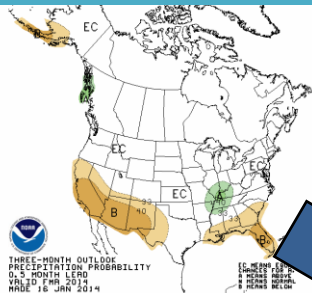
State drought plans



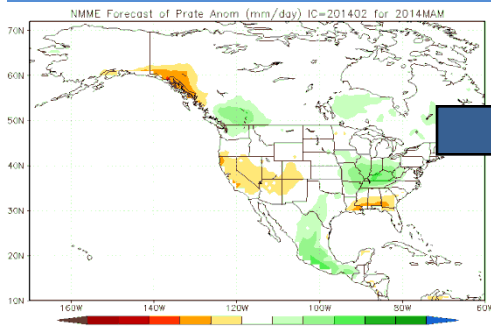


Principal Monthly/Seasonal Drought Outlook Inputs

CPC Seasonal Outlook

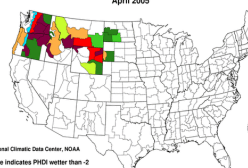


NMME



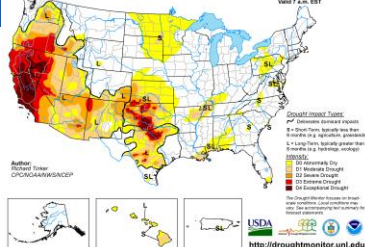
Palmer 4-mo Probabilities

Probability of Precipitation Required to Ameliorate Current Drought Conditions in Four Months
April 2005



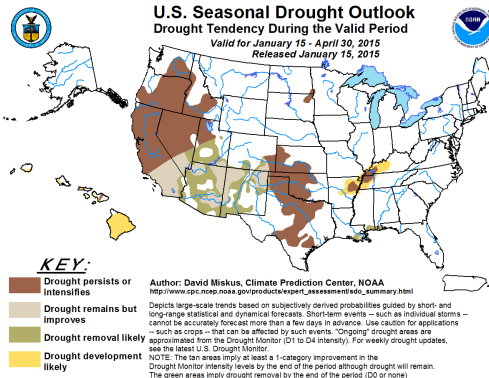
U.S. Drought Monitor

January 20, 2015
(Revised Thursday, Jan. 22, 2015)
Valid 7 A.M. EST

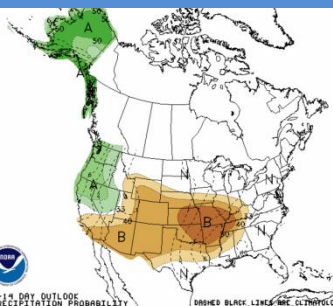


U.S. Seasonal Drought Outlook Drought Tendency During the Valid Period

Valid for January 15 - April 30, 2015
Released January 15, 2015

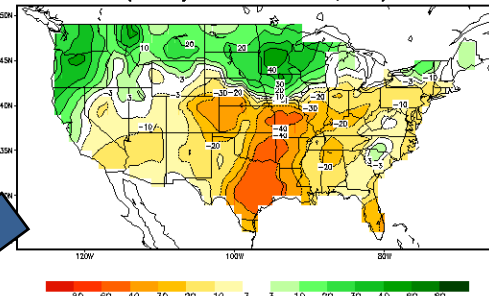


Medium-Range Fcst



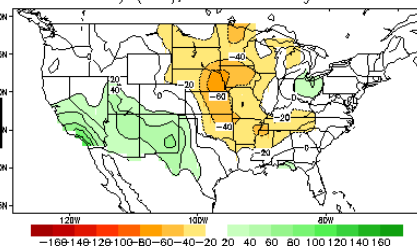
2-Wk Soil Moisture

SM Anomaly Change (mm)
(Last day of WEEK2 - MAY 09, 2005)

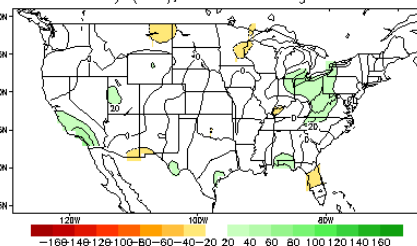


Constructed Analogue Soil Model

Lagged Averaged Soil Moisture Outlook for End of 20050508
units: anomaly (mm), SM data ending at 20050508



Lagged Averaged Soil Moisture Outlook for End of AUG2005
units: anomaly (mm), SM data ending at 20050508



Palmer Z-Index

January, 2015







U.S. Seasonal Drought Outlook Drought Tendency During the Valid Period

Valid for January 15 - April 30, 2015

Released January 15, 2015

extreme
drought

-2.75
and
below

-  Drought persists or intensifies
-  Drought remains but improves
-  Drought removal likely
-  Drought development likely

Author: David Miskus, Climate Prediction Center, NOAA

http://www.cpc.ncep.noaa.gov/products/expert_assessment/sdo_summary.html

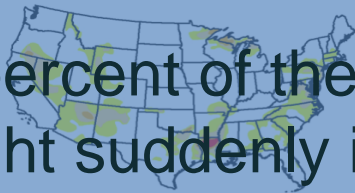
Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events -- such as individual storms -- cannot be accurately forecast more than a few days in advance. Use caution for applications -- such as crops -- that can be affected by such events. "Ongoing" drought areas are approximated from the Drought Monitor (D1 to D4 intensity). For weekly drought updates, see the latest U.S. Drought Monitor.

NOTE: The tan areas imply at least a 1-category improvement in the Drought Monitor intensity levels by the end of the period although drought will remain. The green areas imply drought removal by the end of the period (D0 or none)

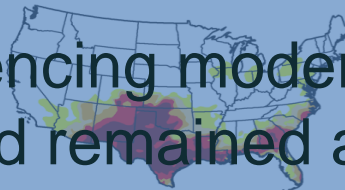
The weather-climate continuum

The percent of the U.S. experiencing moderate to severe drought suddenly increased and remained at elevated levels during the first decade of the 21st Century

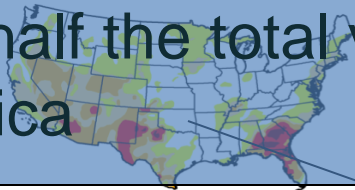
Even a perfect SST prediction would “likely” capture much less than half the total variance in annual precipitation over North America



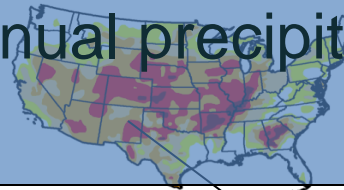
July 2010
8% moderate to exceptional



July 2011
28% moderate to exceptional



May 2012
35% moderate to exceptional



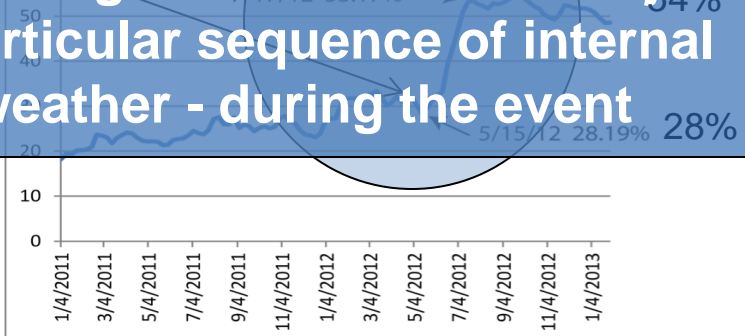
July 2012
64% moderate to exceptional

Area (%) of the US (including Alaska, Hawaii and Puerto Rico) categorized as D1, D2, D3 or D4 on the US Drought Monitor

A complete explanation of these droughts must invoke not just the ocean forcing but also the particular sequence of internal atmospheric variability - weather - during the event



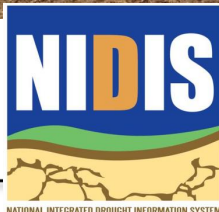
January 2013
The great drought



NOAA Drought Task Force
Narrative Team

Lead: M. Hoerling

Co-Leads: S. Schubert and K. Mo



NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM

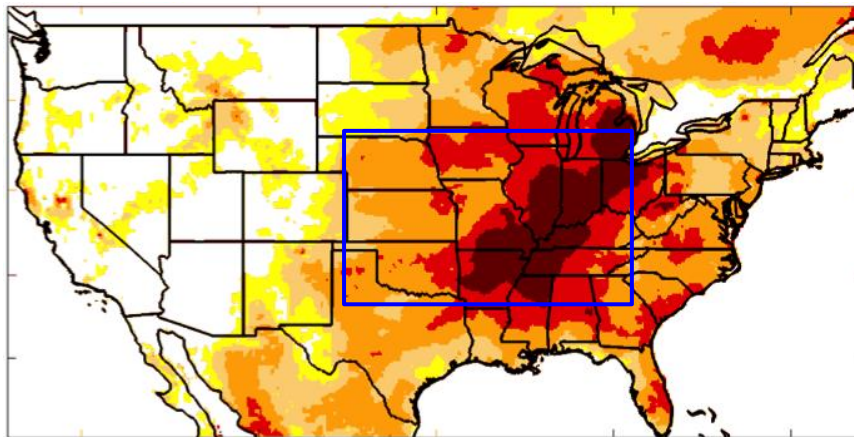
Evaporative Demand Drought Index

EDDI shows strong early warning potential-2012

May 31 7

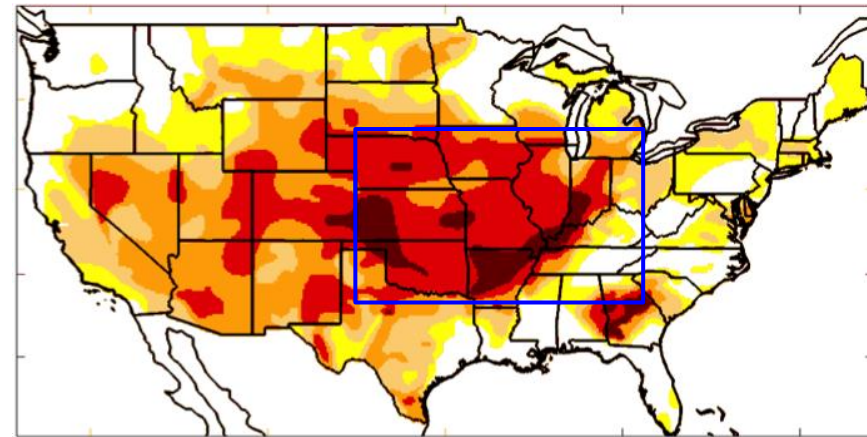
$$EDDI_j = \frac{\sum_{t=i}^j (ET_{0t} - \overline{ET_{0t}})}{\sigma_{\overline{ET_{0t}}}}$$

2-week *EDDI*



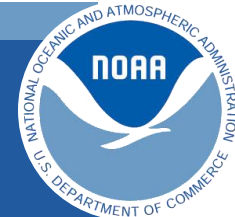
flash drought in MO, AR, KS, OK, TX, NE, and MN; note little drought in western US

USDM



Due to land-atmosphere feedbacks, *EDDI* does not deepen drought in NE, MO, AR, OK, TX, NE, and MN 2 months after *EDDI*

- Due to land-atmosphere feedbacks, evaporative demand (E_0) reflects surface moisture conditions, *often before ET* does,
 - responds positively to both flash droughts and sustained droughts.



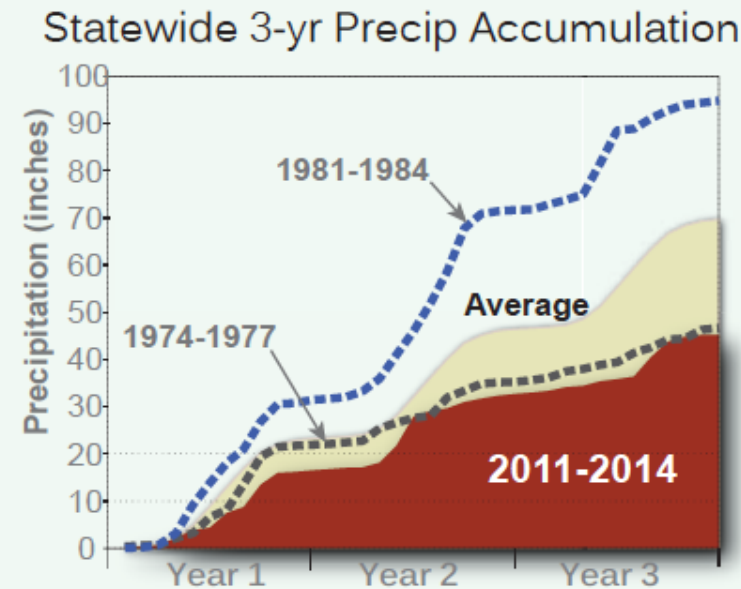
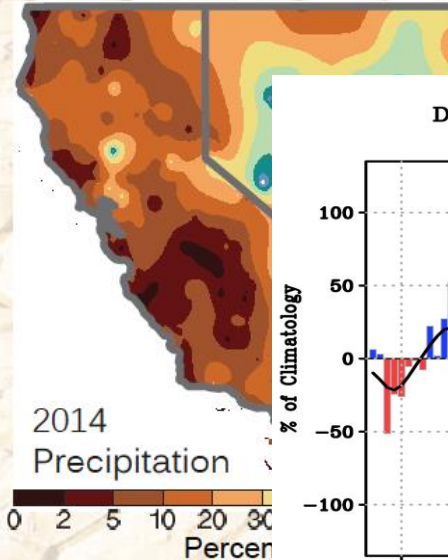
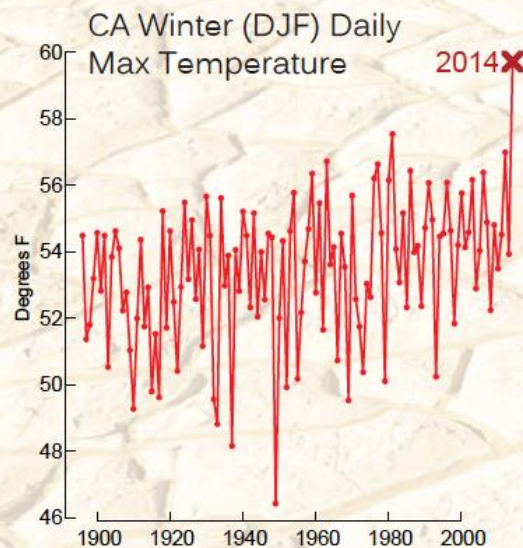
NIDIS Drought-related Activities in California: A Few Examples

- **Causes and Predictability of the 2011-14 California Drought:**
- **Predicting Drought Amelioration: How Much Precipitation is Needed to End a Drought**
- **Within-season monitoring of Fallow Lands** (USDA, NIDIS/NASA, California DWR, others): Timely knowledge of the amount and spatial distribution of fallowing and irrigation
- **California Services Assessment** –assessing response and drought service capabilities in California to inform future actions

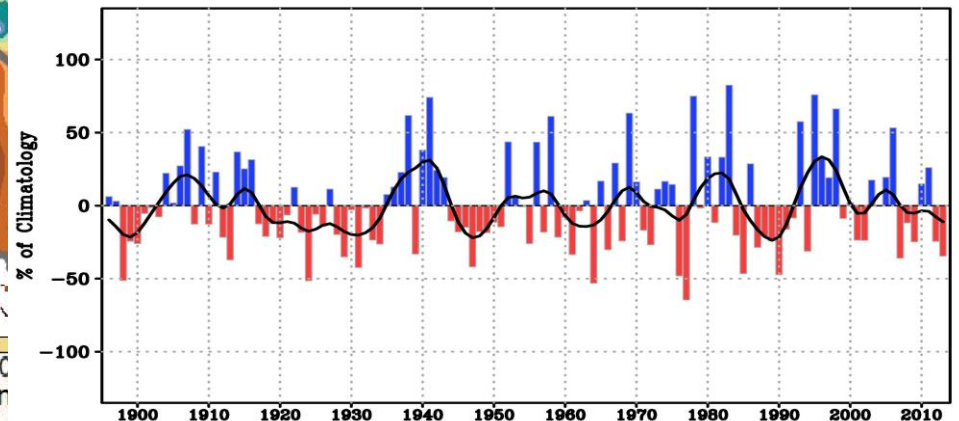
ASSESSMENT REPORT
Causes and Predictability
of the 2011-14
California Drought



The California Drought of 2014: Record Hot, Record Dry



Dec-Apr Precipitation Departures: 1896-2013



- Could “the” drought have been anticipated?
- Is the California drought a symptom of long-term climate change?

Drought Task Force



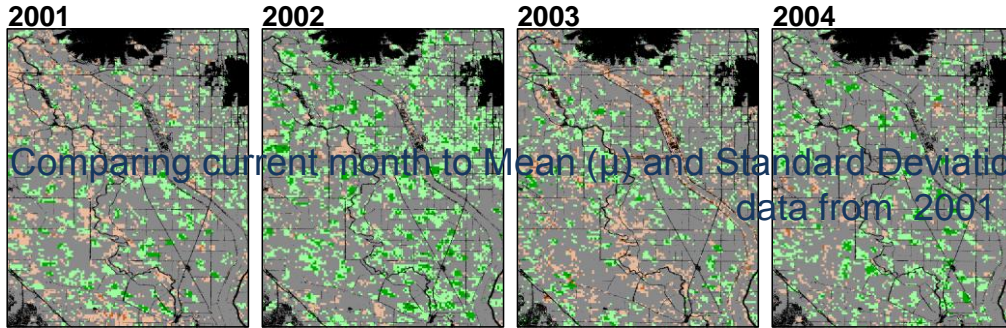
MAPP
Modeling, Analysis,
Predictions, and Projections



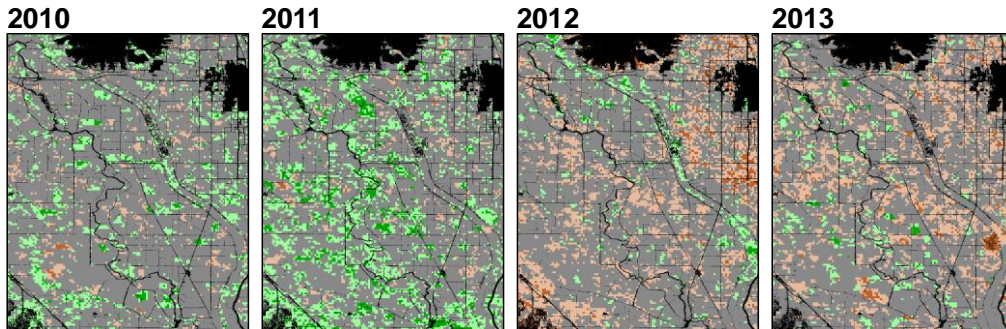
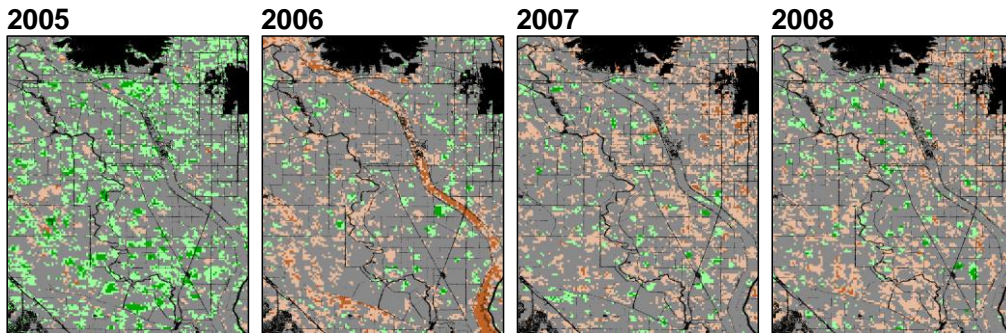
Cropland Greenness in January

A 35% (400,000 acre) increase in fallowing was observed in 2014 relative to 2011, a year of normal water availability-state resources for county food banks

2001

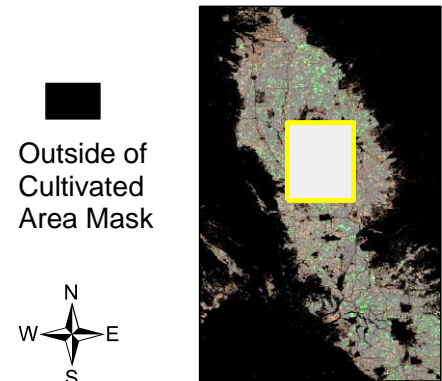
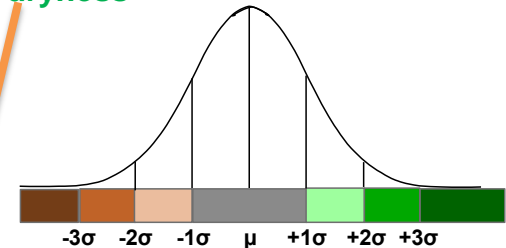
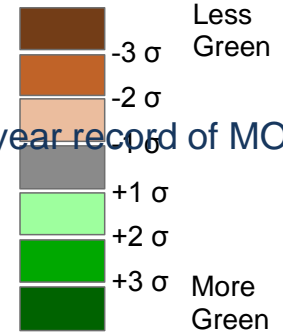


Comparing current month to Mean (μ) and Standard Deviation (σ) for that month in the 13-year record of MODIS data from 2001 to 2013



January Greenness
Deviation from
13 year Average

2014 January
showing extensive
areas of dryness



50

Km

2014

150

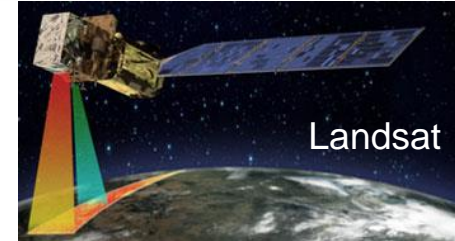
Km

Landsat and Drought Monitoring with

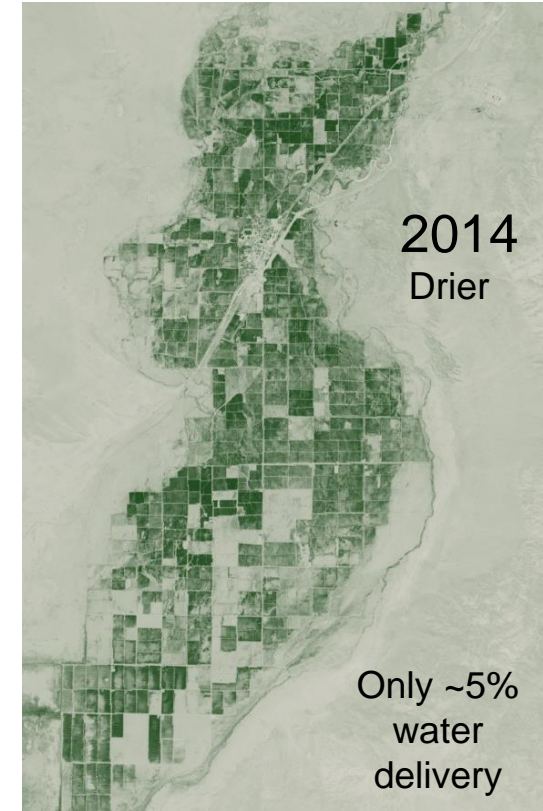
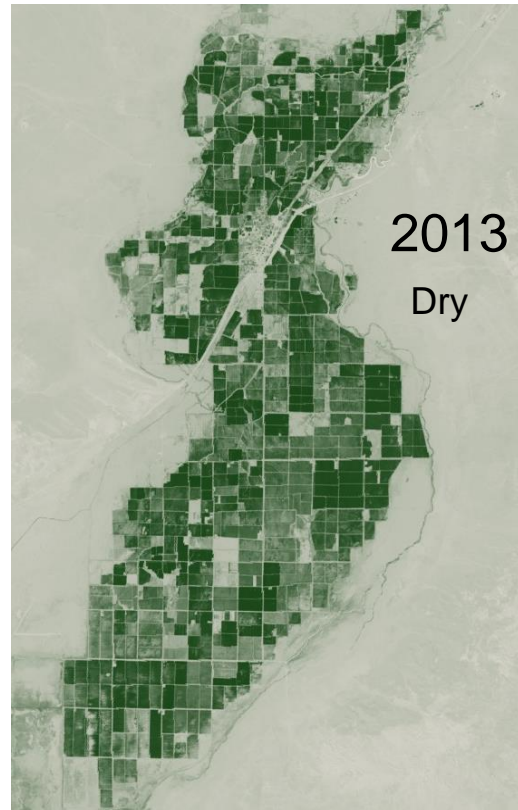


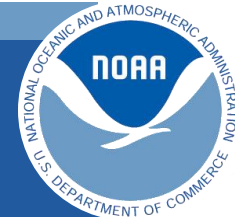
Lovelock, Nevada – Humboldt River Basin

- No groundwater pumping for irrigation (too salty)
- Very little storage upstream
- Extremely sensitive to persistent hydrologic drought



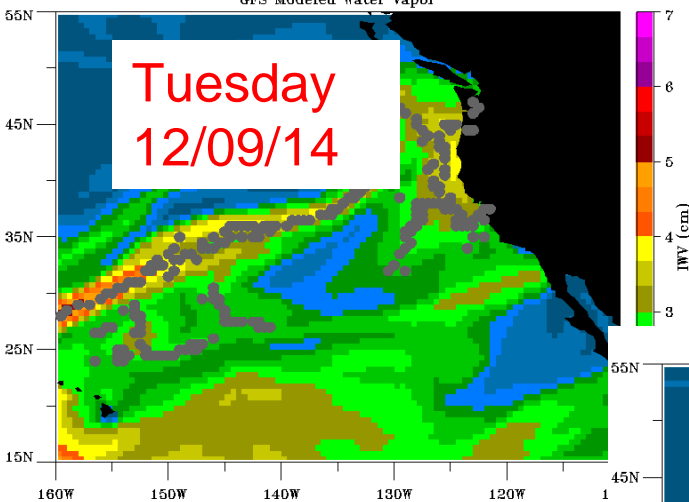
- Growing Season Crop Water Use (30m Pixels) – Computed using Google Earth Engine
- Google hosts the entire 40yr+ Landsat archive and provides parallel cloud computing





Atmospheric Rivers (ARs)

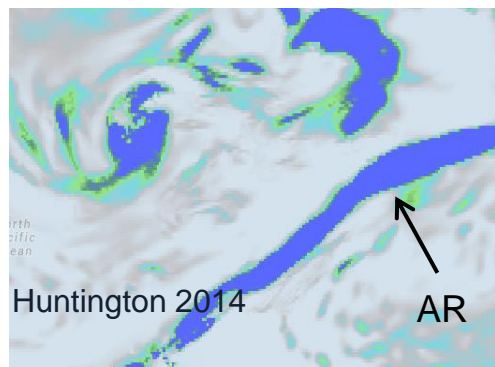
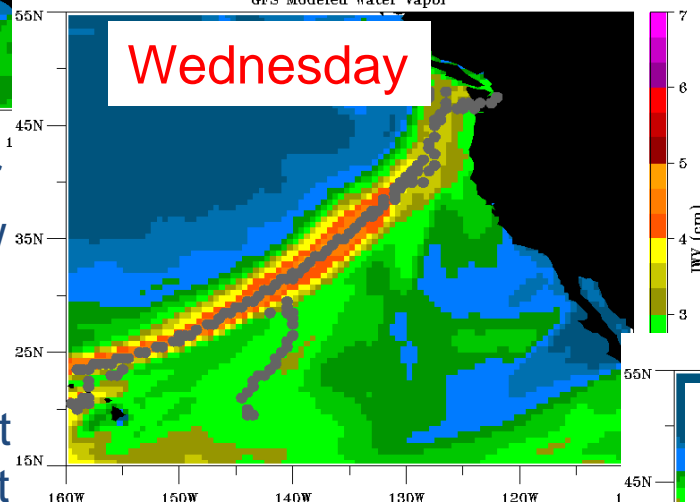
20141204 120 Hour Forecast
GFS Modeled Water Vapor



transport of water vapor
at the boundary of a low
pressure system



20141204 144 Hour Forecast
GFS Modeled Water Vapor

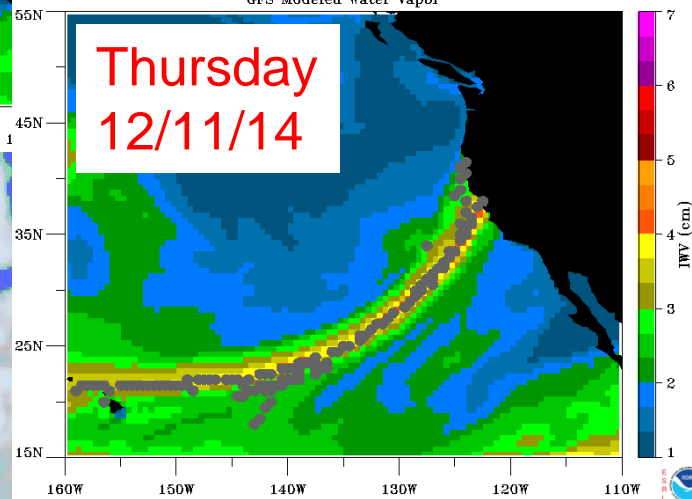


February 8th, 2015

February 8th, 2014

20141204 168 Hour Forecast
GFS Modeled Water Vapor

Thursday
12/11/14



- ~ 40-70% of the drought breaks in the west coast since 1950 are due to ARs
- Large & slow moving ARs can cause flooding

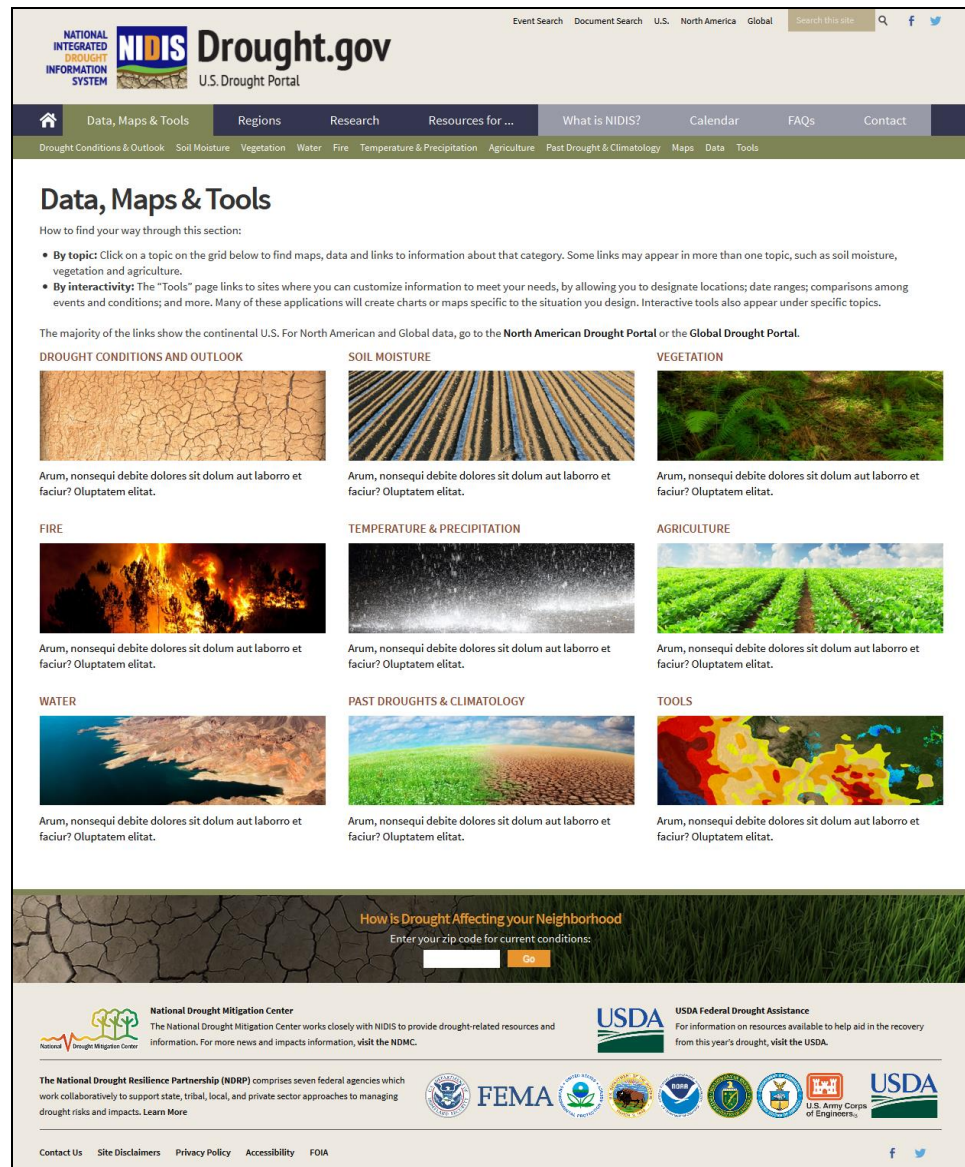
Evolving drought.gov (The NIDIS U.S. Drought Portal)

Intuitive organization:

- Current Drought
- Drought Forecasts
- Drought Impacts

Maintain / expand access to tools:

- Drought ACIS
- Map Viewer
- Time series and pie charts
- Drought Risk Atlas
- Soil moisture viewer
- Drought management database



The screenshot shows the Drought.gov U.S. Drought Portal website. The header includes the NIDIS logo and navigation links for Event Search, Document Search, U.S., North America, Global, and a search bar. The main navigation bar features links for Data, Maps & Tools, Regions, Research, Resources for..., What is NIDIS?, Calendar, FAQs, and Contact. Below this, a secondary navigation bar lists various data categories: Drought Conditions & Outlook, Soil Moisture, Vegetation, Water, Fire, Temperature & Precipitation, Agriculture, Past Drought & Climatology, Maps, Data, and Tools.

The main content area is titled "Data, Maps & Tools" and includes a sub-header "How to find your way through this section:". It provides instructions on how to use the site's features, such as clicking on a topic in the grid below to find maps, data, and links to information about that category. It also mentions that some links may appear in more than one topic, such as soil moisture, vegetation and agriculture.

The grid displays nine categories, each with a representative image and a placeholder text: "Arum, nonsequi debite dolores sit dolum aut laboro et faciu? Oluptatem elitat." The categories are: DROUGHT CONDITIONS AND OUTLOOK (cracked earth), SOIL MOISTURE (tillage patterns), VEGETATION (green field), FIRE (flames), TEMPERATURE & PRECIPITATION (rain clouds), AGRICULTURE (green field), WATER (blue water), PAST DROUGHTS & CLIMATOLOGY (drought map), and TOOLS (drought map).

At the bottom of the grid, there is a section titled "How is Drought Affecting your Neighborhood?" with a form to enter a zip code for current conditions. Below the grid, there is a footer section with logos for the National Drought Mitigation Center, USDA Federal Drought Assistance, and the National Drought Resilience Partnership (NDRP). The footer also includes links for Contact Us, Site Disclaimers, Privacy Policy, Accessibility, and FOIA.






Drought Risk Atlas

NDMC, NIDIS, SARP, USDA/RMA










United States

Tools to make it easier to move from regional to applicable state information.



National Drought Mitigation Center
 The National Drought Mitigation Center works closely with NIDIS to provide drought-related resources and information. For more news and impacts information, visit the [NDMC](#).


USDA Federal Drought Assistance
 For information on resources available to help aid in the recovery from this year's drought, visit the [USDA](#).

The National Drought Resilience Partnership (NDRP) comprises seven federal agencies which work collaboratively to support state, tribal, local, and private sector approaches to managing drought-related risks and impacts. [Learn More](#).

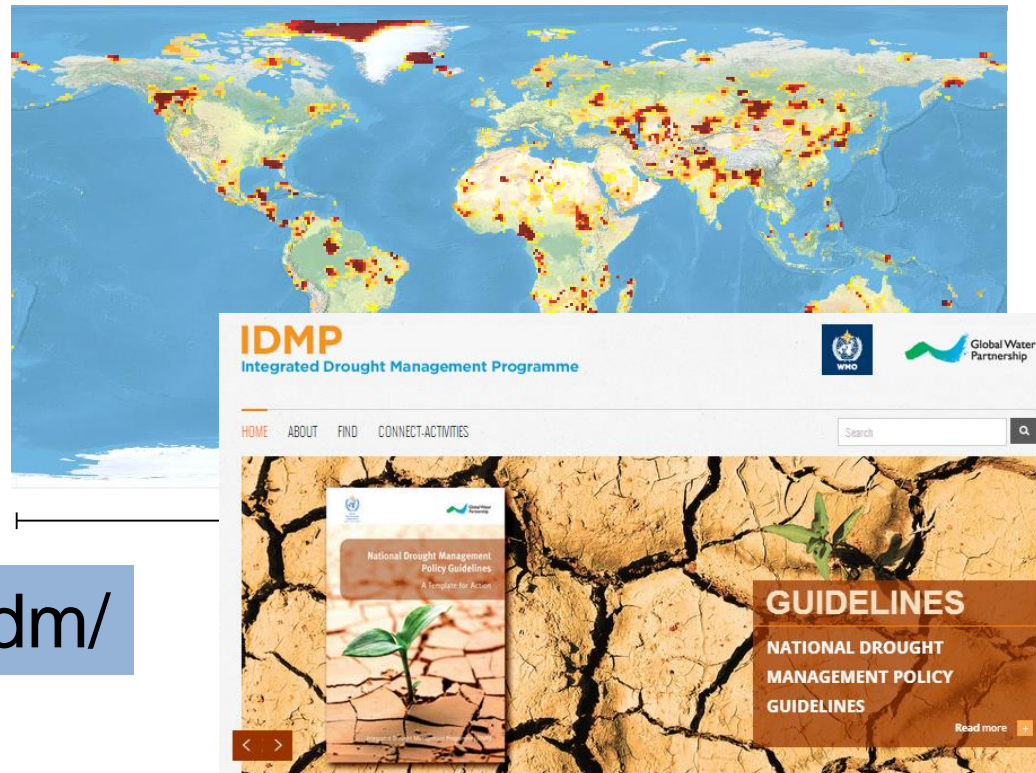
Use NIDIS Drought Portal as IT Foundation for Clearinghouse for International Drought Information and Services



- ✓ Workshop on the Development of an Experimental Global Drought Information System (GDIS), 21-22 April 2010, Asheville, NC, USA
- ✓ 11-13 April 2012, Frascati, Italy, 10-12 December 2014 Pasadena CA

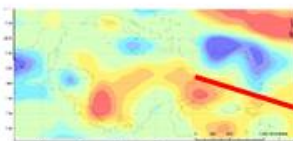
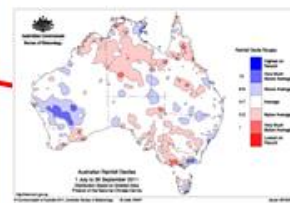
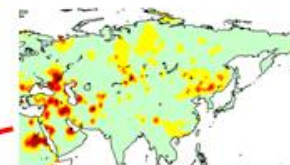
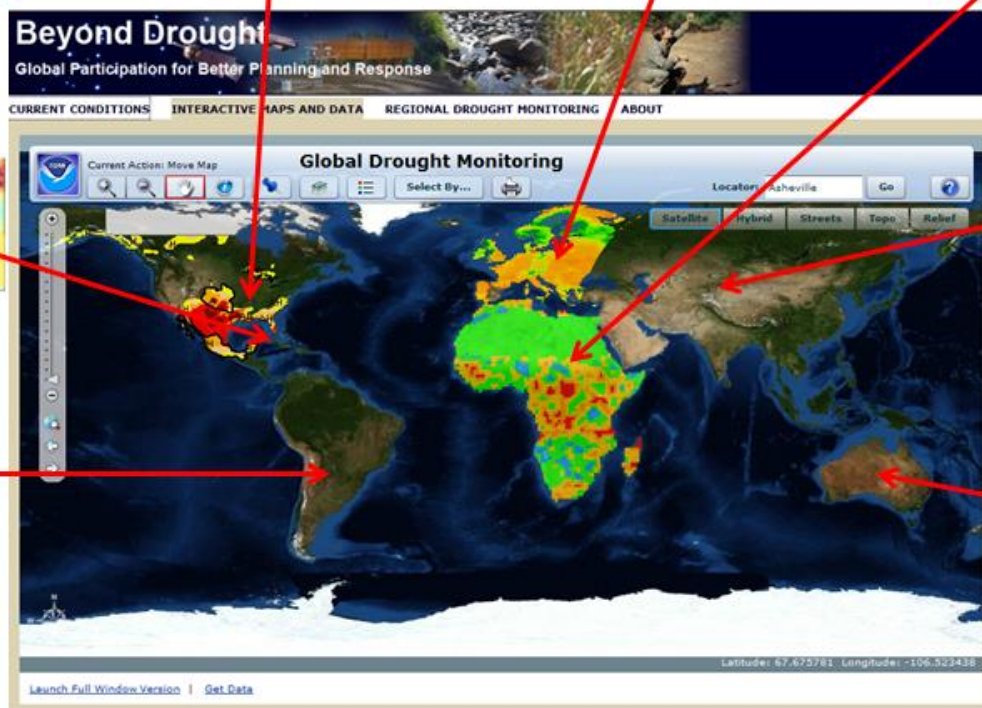
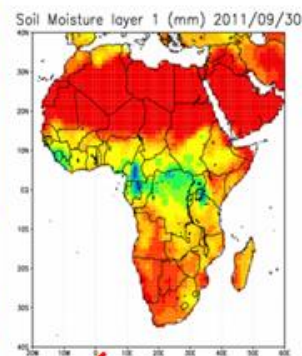
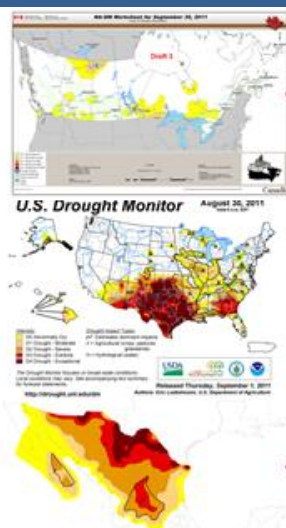
Global Drought Monitor

- ✓ With a web-services-based Clearinghouse foundation (Global Drought Monitoring web portal), a GDEWS is being constructed atop it by integrating continental and regional Drought Monitors & services.



<http://www.drought.gov/gdm/>

Global Drought Monitoring Conceptual Framework – An Integration of Continental / Regional Drought Monitors





RAIN



Apathy



DROUGHT

"Hydro-Illogical" Cycle



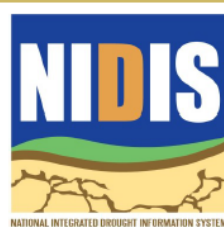
Panic



MORE DROUGHT



Concern



NIDIS Drought Early Warning Pilot in the Apalachicola, Chattahoochee, and Flint River Basin: Evaluation of Activities and Outcomes

Quarterly Climate Impacts and Outlook

Regional Impacts for September-November 2014

Drought, Flooding and Water Resources
Storage in northern California's Lake Oroville bottomed out Nov 21 at 88,221 acre-ft, 42% of historical average capacity. This is among lowest storage amounts on record.
Nearly all of CA's major reservoirs are below 50% average capacity. NV and eastern OR reservoirs low as well.
Wells in rural CA communities continue to run dry; residents relying on bottled or transported water. Tulare, San Mateo counties hardest hit.
California passed groundwater management legislation, voters approved \$7.5B in water bonds. After 3+ years of drought, increased public and political attention.

Agriculture, Wildlife and Fisheries

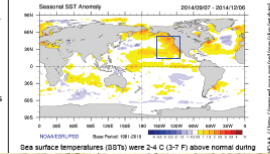
Increase in lemon and hay prices; production fell for rice, grapes, oranges, pistachios, etc.

Due to drought, fewer and smaller grapes produced equal low water in wetland areas of paths of ducks and other waterfowl. Bear encounters with humans in Sierra Nevada and Oregon.

Fire

In September, the King Fire of Sierra Foothills west of Sacramento structures and cost \$50 million.

Exceptionally warm ocean temperatures off US West Coast



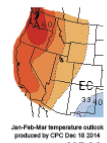
ASSESSMENT REPORT Causes and Predictability of the 2011-14 California Drought

An Interpretation of the Origins of the 2012 Central Great Plains Drought

From Too Much to Too Little:

How the central U.S. drought of 2012 evolved out of one of the most devastating floods on record in 2011

Regional Outlook



NOAA

Above normal temperatures at departures from normal in One the development of a weak to the northern tier of the region.

NMME Precipitation

The National Multi-Model Ensemble (NMME) is an experiment to improve performance by combining 8 different seasonal models. Past performance shows moderate skill, at least equi methods. The NMME for Jan-Feb 2015 shows a weak to the northern tier of the region. The NMME is to the official seasonal outlook above.

Contacts: Nina Colley (Nina Colley@noaa.gov), Carole Brown (cbrown@noaa.gov), Kelly Redmond (Kelly.Redmond@noaa.gov)

MANAGING DROUGHT IN THE SOUTHERN PLAINS

You are invited to join us in a webinar (web-based seminar) series to discuss drought conditions, impacts and resources available to help manage drought in the Southern Plains. Webinars will be held on the 2nd Thursday of each month at 11:00 A.M. Central Time. A shortened briefing will also be offered on the 4th Thursday. The content is geared toward a general audience – anyone who has responsibility to manage or assist others in managing drought and its related impacts.

If you would like to join in these webinars, you need to register via the SCIPP website: <http://www.southernclimate.org> or e-mail scipp@mesonet.org. For each webinar, you will receive an e-mail with the link to access the webinar. Each webinar will last 45-60 minutes.

Each webinar will include an overview of the current drought assessment and outlook, summary of impacts across the region, and a topic or resource, such as La Niña or wildfire conditions. You will have an opportunity to suggest topics for following webinars. The primary focus is in the states most heavily impacted from the current drought - Texas, Oklahoma and New Mexico - but participation from surrounding states is encouraged.

The webinar series is sponsored by a partnership of the National Integrated Drought Information System (NIDIS), National Oceanic and Atmospheric Administration (NOAA), National Drought Mitigation Center, Southern Climate Impacts Planning Program, Climate Assessment for the Southwest, and the region's State Climatologists.

Information from the webinars will be posted on a website linked through <http://www.southernclimate.org>. A two-page summary will be produced and posted for each webinar. Please pass on this announcement to relative organizations or groups that are involved in managing or monitoring drought and its related impacts.

To register or for more information, contact:

Southern Climate Impacts Planning Program
<http://www.southernclimate.org>
405-325-2541 or scipp@mesonet.org

Webinar Topics:

- La Niña
- Cattle & Livestock
- U.S. Drought Monitor
- Ecological Impacts
- Seasonal Forecasting
- Flash Drought
- Water Supply
- Wildfire
- Drought Ready Communities
- Agricultural Impacts



Assessment Report

NOAA Drought Task Force Narrative Team

Lead: Martin Hoerling
Co-Leads: Siegfried Schubert & Kingtse Mo

20 March 2013

Weekly Climate, Water & Drought Assessment



Managing Drought Risk on the Ranch

MINISTRATION

Overview Register Login

Managing Drought Risk on the Ranch

Drought is a normal part of climate...it will happen again. Fortunately, there are things you can do before, during, and after drought to reduce your risk. Ranchers are increasingly implementing new ways to better prepare for and respond to drought.

The information, strategies and resources on this site are designed to provide livestock producers in the **Great Plains region** with information on how to incorporate management strategies to reduce the threat drought poses to livestock and forage operations.

Workshops and Webinars

Managing Drought Risk on the Ranch Professional Development Webinar Series

10 am Central Time
January - May, 2013
Last Wednesday of each month

Each session will include a briefing on current drought status, followed by a session on a specific topic or tool related to drought planning.

January 30: Managing Drought Risk on the Ranch: The Planning Process
Jerry Volesky, Range and Forage Specialist at the West Central Research and Extension Center, and Lynn Myers, Tippetts-Myers Ranch

February 27: Avoiding Analysis Paralysis: Monitoring and Setting Critical Dates for Decision Making During Drought
Dwayne Rice, Rangeland Management Specialist, USDA-NRCS

Download "Managing Drought Risk on the Ranch" Handbook



If you are unable to download this document, you would like to receive a paper copy, please contact the NDMC at ranchplan@unl.edu 472-6781.

[How to use this site](#)

Drought Conditions
[U.S. Drought Monitor](#)

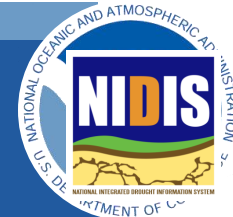
2012

Managing Drought Risk on the Ranch

A Planning Guide for Great Plains Ranchers

- NDMC
- USDA-RMA
- USDA-SARE
- Cooperative Extension
- NIDIS

Available Online at:
www.drought.unl.edu/ranchplan



USDA / NOAA

Memorandum of Understanding

- First signed in 1983;
- Renewed December 2012;
- Allows for development of cross-agency Subsidiary Agreements.



MEMORANDUM OF UNDERSTANDING BETWEEN THE U.S. Department of Commerce AND THE U.S. Department of Agriculture

I. General Information

WHEREAS, the U.S. Department of Commerce (Commerce) has responsibility for supporting and sustaining economic growth and development, and, through the National Oceanic and Atmospheric Administration (NOAA), monitoring, and climate extreme interest to agriculture of economies and

WHEREAS, the Federal Government and natural resource climate information impacts of weather agricultural production

WHEREAS, the tribal lands, the weather events temperature, and

NOW, THERE Understanding and application management decisions, with availability, water environmental,

II. Reference

Commerce and Agriculture entities. This MOU supports coordination and

SUBSIDIARY INTERAGENCY AGREEMENT BETWEEN THE U.S. Department of Commerce NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) and the U.S. DEPARTMENT OF AGRICULTURE (USDA)

Regarding Cooperation on the Successful Application of the
NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM (NIDIS)

I. General Information

This agreement is a subsidiary to the Interagency Agreement dated December 21, 2012, between the Department of Commerce and the Department of Agriculture, which provides for cooperation in efforts to advance the development, sharing, and application of weather, climate, economic, and demographic information for risk management with respect to agriculture, forestry, and other resource management decisions, with an emphasis on food and energy security, international trade, water availability, water management, and ecosystem protection in the face of changing environmental, economic, and social conditions.

II. Reference and Authorities

This agreement is executed pursuant to the provisions of 7 U.S.C. 2201 and 15 U.S.C. 313.

III. Purpose

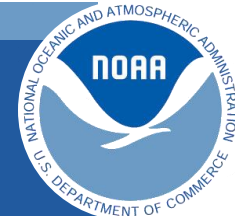
The purpose of this subsidiary agreement is to establish a framework by which agencies within the Departments of Commerce and Agriculture can work together towards improving their capabilities to monitor and plan for drought, and support risk management strategies, with particular emphasis placed on serving the interests of the agricultural and forestry communities. This will be accomplished by fully using the existing infrastructure of both Departments through cooperative processes established in the development and implementation of the National Integrated Drought Information System (NIDIS), including opportunities to expand collaborative research and outreach activities addressing drought risk management and resilience. Particular activities addressed by this subsidiary agreement are:

- Increased collaboration on the development and implementation of tools and products to improve the reliability and accuracy of drought monitoring, predictions and projections, including those products used in the production of the U.S. Drought Monitor;
- Improving accessibility, compatibility, and sharing of data, analysis, and expertise supporting the development of regional drought early warning systems;
- Establishment of a National Soil Moisture Monitoring Network, with emphasis on expansion into under-served regions, including tribal lands;
- Support of sciences and assessments for drought recovery and response;

Subsidiary Agreement: Cooperation on Drought

“establish a framework by which agencies within the Departments of Commerce and Agriculture can work together towards improving their capabilities to monitor and plan for drought, and support risk management strategies, with particular emphasis placed on serving the interests of the agricultural and forestry communities.”





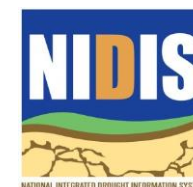
Developing a Coordinated National Soil Moisture Network

National Workshops -Recommendations

- Expert Working Group -Plan of Action
- Develop a sub-national pilot system
- Develop a nationwide “best available” product by blending data from disparate sources

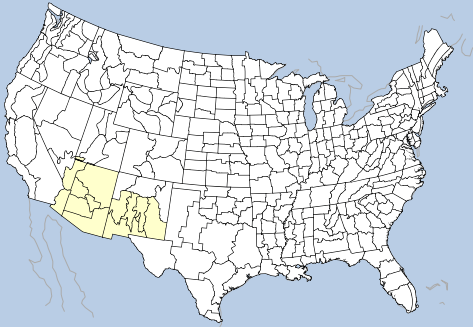
NIDIS complements the National Drought Resilience Partnership goals:

- integrates information on key indicators of drought and drought impacts
- Provides usable, reliable, and timely forecasts of drought drought and impacts



Are Transitions to Semi-Permanent Drought Imminent?

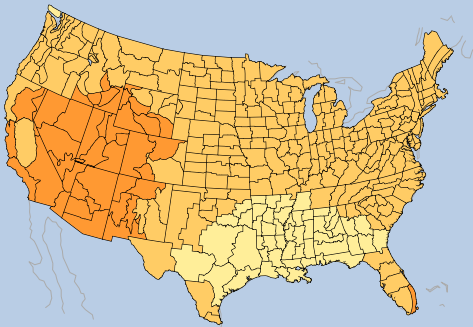
Precipitation



Soil Moisture

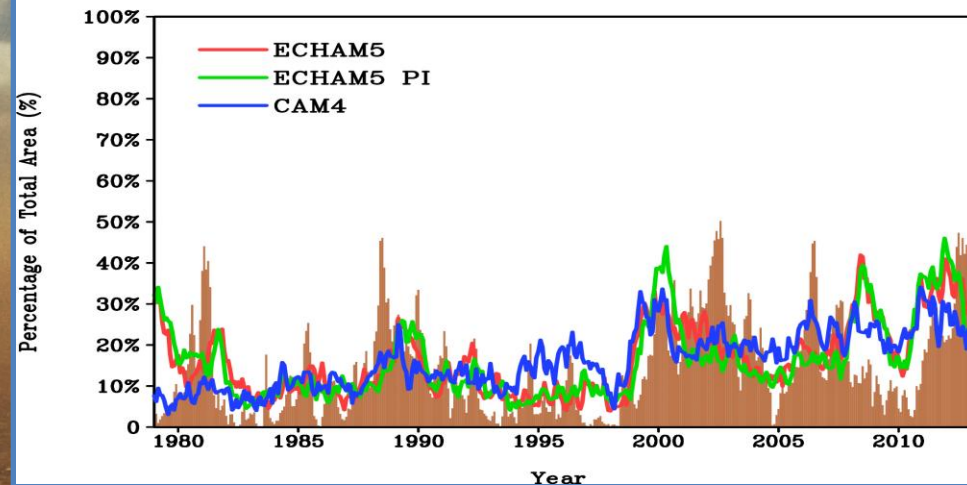


Temperature

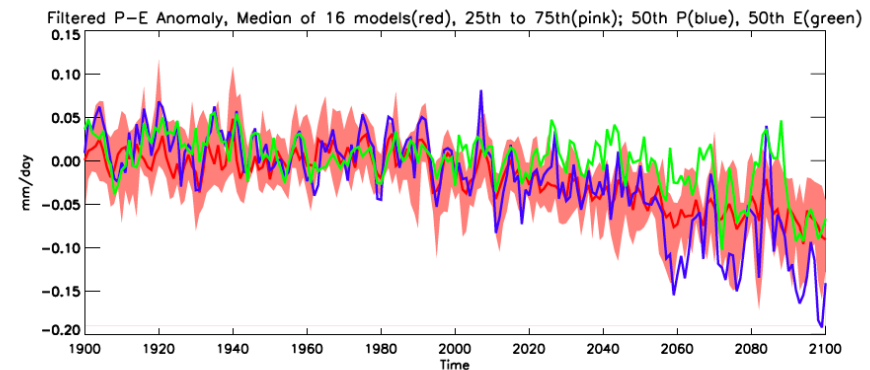


Effect of Long Term Global Ocean Warming and
Radiative Forcing since 1880
ECHAM5 Historical Simulations

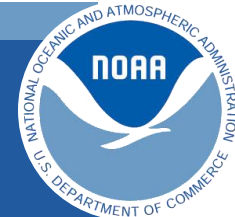
Percent Area of the Contiguous U.S.
with Soil Moisture $< -1\sigma$



P , E and $P-E$ averaged across all of SW North America in
the IPCC AR5 global climate model simulations and
projections for 1900 to 2100



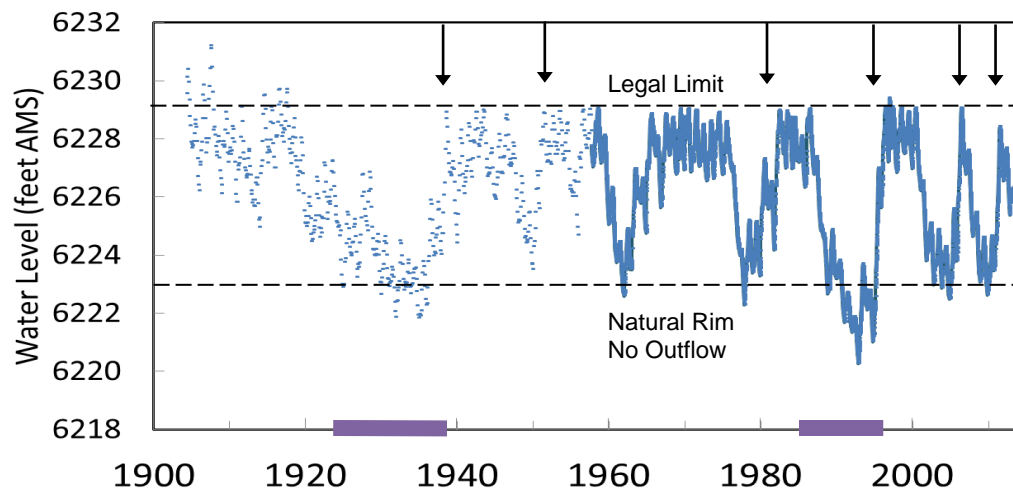
Ongoing transition to a drier climate driven by decreasing precipitation



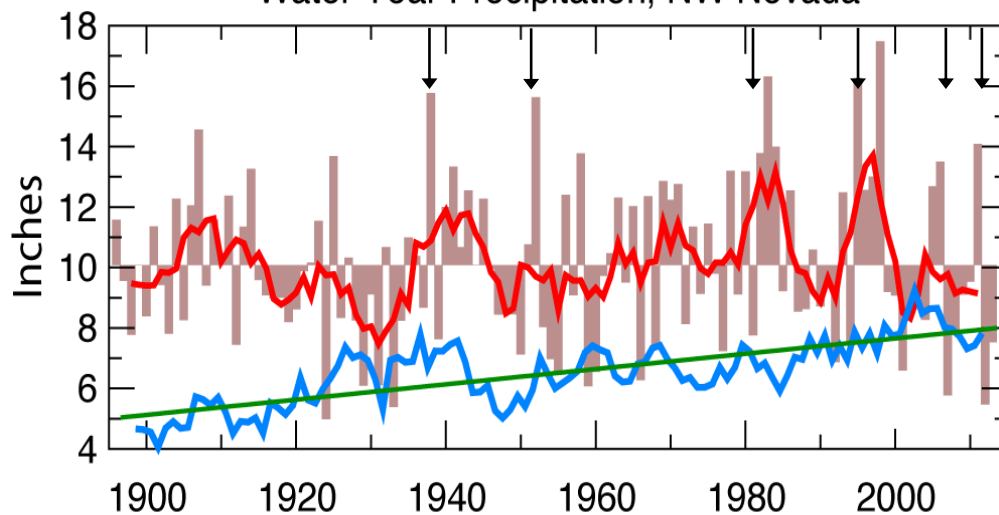
Lake Tahoe Recent Drought History

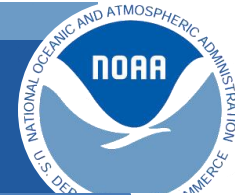
- Water levels in Lake Tahoe are good indicators of persistent hydrologic droughts
- Many years in a row of no outflow into Truckee River (30s & 90s)
- Lower water levels in the 90s than in 30s due to increased demands
- **One very wet winter can break a persistent drought in the region**
 - Need many very wet winters for reservoirs with large storage deficits (i.e. Lake Mead)

Lake Tahoe Water Level



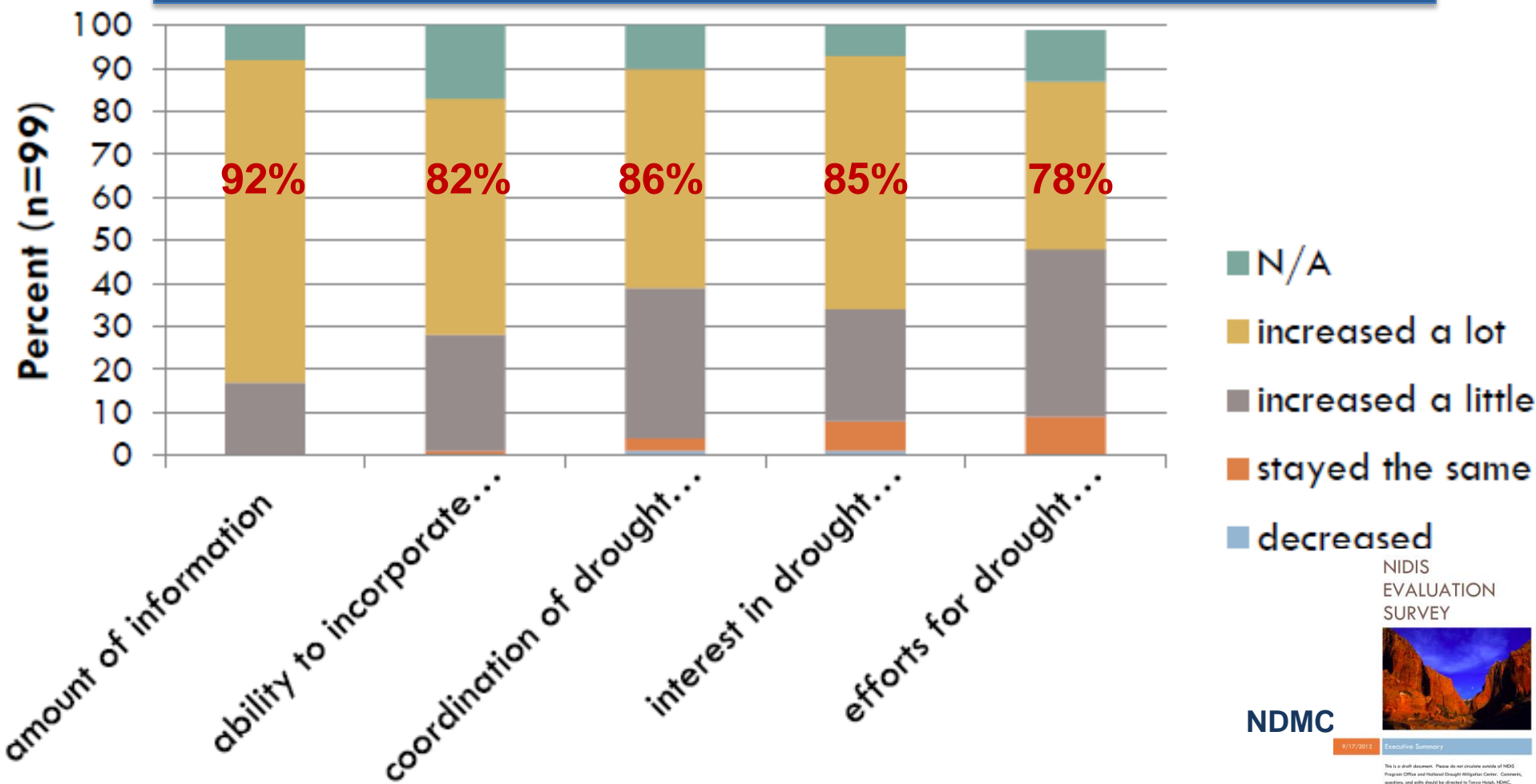
Water Year Precipitation, NW Nevada





NIDIS Evaluation

“Comparing readiness for drought before 2002 with now.....”



NDMC

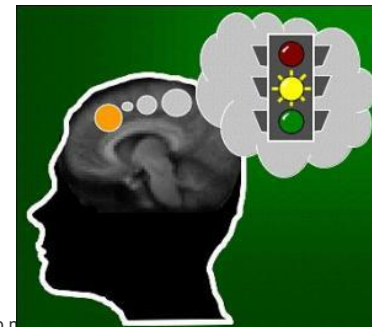
8/17/2012 Executive Summary

This is a draft document. Please do not circulate outside of NIDIS Program Office and National Drought Integration Center. Comments, questions, and edits should be directed to Teresa Hengg, NIDMC, teresa.hengg@noaa.gov, 402-473-6761.

Focus on capacity and improving decisions-as well as “big data” (heterogeneity, scale, timeliness, complexity)



How often should criteria for “robustness” be (re)considered?





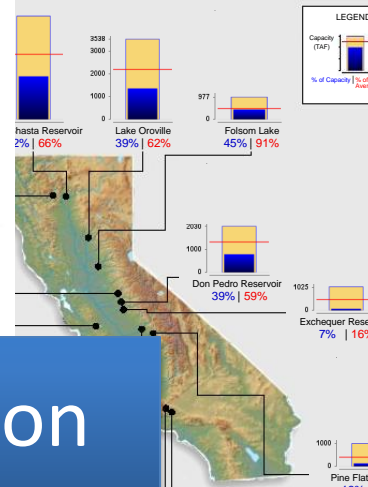
Thank you!



Reservoir Conditions

Ending At Midnight - January 5, 2014

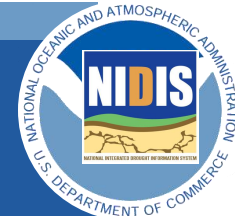
RESERVOIR CONDITIONS



NDMC

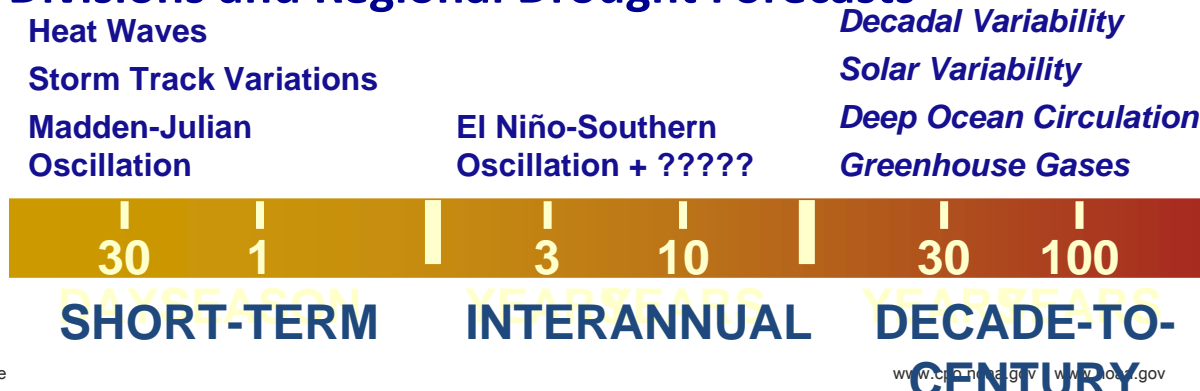


Coordination

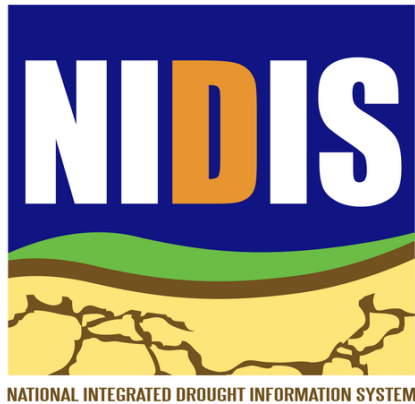


Forecasting Tools Development-NIDIS CTB

- Updated Optimal Climate Normals (Temperature & Precipitation Trends)
- Improved Understanding of Drought and Ocean Conditions
- ENSO Plume Model Forecasts
- *Improved Understanding of Drought and Land Conditions*
- *Reliability Conditioned on Decadal Variability*
- *National MultiModel Ensemble (NMME)*
- Land-Data Assimilation System (LDAS)
- NOAA Drought Outlook
- Experimental Climate Divisions and Regional Drought Forecasts



NIDIS complements the National Drought Resilience Partnership goals



National Integrated Drought Information System: Public Law 109-430; reauthorized in 2014 PL 113-086

- integrates information on key indicators of drought and drought impacts
- Provides usable, reliable, and timely forecasts of drought drought and impacts
- Improve national coordination of soil moisture monitoring

Information sharing
and collaboration
across all levels of
government to
promote drought
preparedness &
planning

